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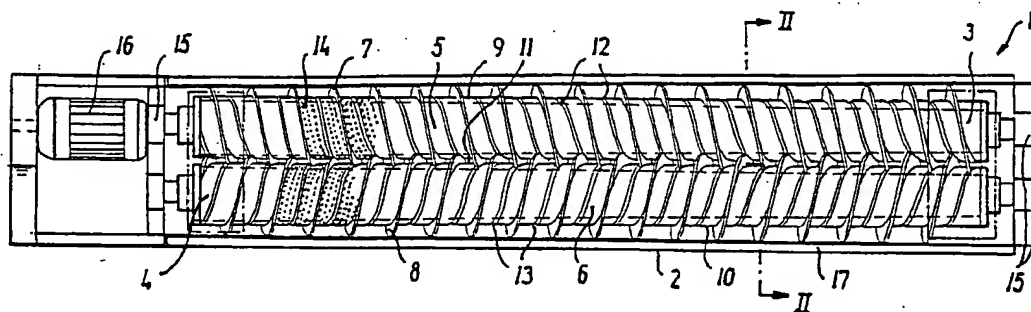
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[Continued on next page]

(54) Title: A SCREW PRESS AND A METHOD OF PRESSING A LIQUID-CONTAINING SUBSTANCE AS WELL AS USE THEREOF



(57) Abstract: A screw press comprising a housing having an inlet for a substance which is pressed in the press, an outlet for discharging the pressed material, as well as at least two oppositely rotating stems around which stems threads are arranged. Each stem is surrounded completely or partially by a jacket for providing a first gap between the outer surface of the stem and the inner surface of the jacket, and the jacket comprises grooves/recesses in which grooves/recesses the threads from the adjacent stem engage. This ensures inter alia that the risk of the substance running back is reduced significantly, as there is no communication from a thread space to the adjacent thread space, apart from the clearance that might exist between thread and jacket plate, which is extremely easy to adjust because of the simple structure. It is ensured that the time of residence is reduced significantly, since the risk of the substance running back and of the same substance running around again is reduced because of the features above. Further, an increased drainage takes place in relation to the known structures in the cases where the sheath/jacket is made of a sieve plate, so that the drainage area is increased, while the mentioned weakening of the stem does not take place.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A SCREW PRESS AND A METHOD OF PRESSING A LIQUID-CONTAINING SUBSTANCE AS WELL AS USE THEREOF

5 The invention relates to a screw press comprising a housing having an inlet for a substance which is pressed in the press, an outlet for discharging the pressed material, as well as at least two oppositely rotating stems around which stems threads are arranged. The invention also relates to a method of pressing a liquid-containing substance in a screw press comprising a housing having an inlet for a substance which is pressed in the press, an
10 outlet for discharging the pressed material, as well as at least two oppositely rotating stems around which stems the threads are arranged. Finally, the invention relates to use of both the screw press and the method.

15 Screw presses comprising two oppositely rotating stems are generally known for dehydration of materials. During dehydration, the substance will be admitted via an inlet opening, and the rotation of the two oppositely rotating stems having threads will cause pressing of the liquid, whereby liquid is pressed out, while the substance is moved toward the outlet opening disposed at the other end of the screw press.

20 Such a structure is known e.g. from Norwegian Patent Specification NO-B-116885. This screw press is additionally equipped with milled grooves in the stems so that the threads fit in these. This is stated to result in an increased pressing of the substance so that the capacity of the press is as great as possible. However, the press has the drawback that the grooves
25 concerned are milled into the stem, which results in a significant weakening of it. Moreover, such a structure will be difficult to manufacture so exactly that the milled grooves fit 100% in the oppositely disposed thread, and therefore the engagement of a thread in a groove will typically be insufficient. This results in a risk of backflow, and the desired increase in capacity,
30 which might be the purpose of the structure, is not achieved.

Accordingly, the object of the present invention is to provide a structure as well as a method which eliminate the above-mentioned drawbacks, and also significantly reduce the risk of the substance running backwards, as there is no communication from a thread space to the adjacent thread space, apart from the clearance which might exist between the thread and the jacket plate, which is extremely easy to adjust because of the simple structure. Further, it is ensured that the residence time is reduced significantly, as the risk of the substance running backwards and of the same substance running around again and again, is reduced because of the features above. Further, increased drainage takes place in relation to the known structures in the cases where the jacket/sheath is made of a sieve plate, thereby increasing the drainage area while obviating the mentioned weakening of the stem. Finally, an extremely great effect of the press is achieved, and a corresponding possibility of making the screw press short and of using high pressures. This additionally reduces the time during which the substance has to stay in the press.

This object is achieved by a screw press and a method of the type stated in the opening paragraph, and wherein the stems of the screw press are also surrounded completely or partially by a jacket for providing a first gap between the outer surface of the stem and the inner surface of the jacket, and the jacket comprises grooves/recesses in which grooves/recesses the threads from the adjacent stem engage. The same advantages are achieved by a method of the type stated in the opening paragraph, wherein the screw press also comprises a jacket, said jacket being formed with grooves/recesses in which the threads from the adjacent stem engage, said threads in the grooves/recesses performing pressing of the substance by opposite rotation of the two stems, said substance being pressed in areas disposed between two adjacent jackets as well as the defining threads/grooves/recesses.

The press and the method thus operate in that the substance is admitted through an inlet opening. The two stems rotate oppositely to each other, and the substance will thus be pressed in the spaces that occur between a thread which engages a corresponding recess on the opposite stem. The substance is now pressed forwards, and the tight engagement between

thread and recess ensures that a substance having been pressed does not run backwards. ~~The liquid pressed-out is conveyed away. It either leaves the space through the sheath/jacket, which is made of a sieve plate having suitably sized sieve holes adapted to the product and arranged closely spaced, preferably in the entire extent of the sheath, or the liquid leaves the spaces via openings which are provided in the surface of the housing. The liquid is thus collected at the bottom, from where it runs further on and is removed. The dehydrated substance is now discharged from the outlet opening, from where the further processing of it takes place.~~

By providing a screw press according to the invention and as additionally stated in claim 2, adjustable squeezing/pressing is achieved according to which spacing exists between the two conical stems.

By providing a screw press according to the invention and as additionally stated in claim 3, adjustment of the amount of the pressing of the substance is achieved, which may be an advantage, in particular in case of a very lumpy material.

By providing a screw press according to the invention and as additionally stated in claim 4, an expedient form of the active parts is achieved.

By providing a screw press according to the invention and as additionally stated in claims 5 and 6, increased pressing is achieved at the same effect.

By providing a screw press according to the invention and as additionally

stated in claims 7 and 8, expedient embodiments of the screw press are achieved concerning the structure of the threads, which may thus either form an integrated part of the stem itself, or form part of the jacket itself.

5 By providing a screw press according to the invention and as additionally stated in claims 9 and 10, a distinct impact on the substance is achieved, as the same pressing space between the two stems is achieved, even though these are conical in shape.

10 By providing a screw press according to the invention and as additionally stated in claim 11, an increased drainage area for the pressed substance is achieved.

15 By providing a screw press according to the invention and as additionally stated in claim 12, a simple way of manufacturing the jacket is achieved.

By providing a screw press according to the invention and as additionally stated in claim 13, an additional pressing volume is achieved.

20 By providing a screw press according to the invention and as additionally stated in claim 14, it is possible to vary the pressing volume between the two screws, which it may be relevant to adjust as a function of the consistency of the substance.

25 The invention also relates to a method as stated in claim 15, which has been disclosed above.

30 Additionally, as stated in claim 16, the invention relates to use of the press itself and the method itself, preferably for the treatment of a liquid-containing substance, e.g. fish offal, sugar beet waste, etc.

The invention will now be explained more fully with reference to the drawing, in which

- fig. 1 shows a basic drawing of the entire screw press
5 fig. 2 shows a section along the line II-II in fig. 1
fig. 3 shows a part of the screw press, showing relations between threads and recesses.

10 With reference to the above-mentioned drawing the screw press 1 comprises a housing 2 having an inlet opening 3 arranged at one end of the housing and an outlet opening 4 at the opposite end of the housing. The housing 2 internally comprises two stems, a first stem 5 and a second stem 6 which rotate oppositely and are preferably conical, so that the diameter increases toward the outlet opening. The stems extend horizontally and are
15 suspended from bearings 15 at each end of the housing. The stems are driven by an electric motor 16 having an associated gear structure for adjusting the speed of revolution. The mass is conveyed through the inlet opening 3 and is now pressed in the press, as it is fed forwards toward the outlet opening 4 where the pressed substance is discharged and subsequently processed. The liquid being pressed out is collected in a basket 17
20 surrounding the walls of the housing, openings being provided from the interior of the housing to this annular space, and from where the liquid is conveyed away.

25 As mentioned, the two oppositely rotating screws themselves comprise stems 5, 6 around which stems threads 7, 8 are provided. The threads may be mounted directly on the stem, or the threads may be mounted on a jacket 9, 10 surrounding the stems. The jacket 9, 10 is made of either a sieve plate so that the liquid pressed out, in addition to leaving the press via
30 the basket 17 of the housing, may also leave it via openings in the sheaths/jackets 9/10, said liquid being collected in a space disposed be-

5 between the inner surface of the sheath and the outer surface of the stems 5, 6. The threads are screw-shaped, and the pitch may vary, as it may increase toward the outlet. Also, the height of the threads will vary, as these also increase toward the outlet in the height. The jacket 9, 10, which surrounds each of the stems 5, 6, is typically cylindrical or at any rate a rotation-cylindrical member having a longitudinal axis coinciding with the axis of rotation of the respective stems.

10 Finally, the housing itself may be shaped conically so that the diameter decreases toward the outlet opening.

The jackets 9, 10 are formed with screw-shaped recesses/grooves 12, 13, so that the thread from the stem disposed in parallel fits in the adjacent grooves.

15 As will appear from fig. 1, the screw press thus comprises a first stem 5 and a second stem 6, said first stem being equipped with first threads 7 and said second stem with second threads 8. The threads are screw-shaped, as mentioned. The first stem is surrounded by a first jacket 9, and the second stem is surrounded by a second jacket 10, said jackets being rotation-symmetrical, as mentioned, preferably cylindrical. Thus, a first gap 11 is established between the first jacket and the second jacket, said first gap having the same distance, but the volume may be changed according to whether the pitch of the threads and thus also of the recesses is changed.

20 Optionally, the jackets are formed with sieve holes 14 extending there-through.

25

Each jacket comprises grooves/recesses, a first groove 12 being arranged in the first jacket 9, a second groove 13 being arranged in the second jacket 10. These grooves are likewise screw-shaped and have a pitch which corresponds to the pitch of the threads in the oppositely positioned jacket. In

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other words, the first threads 7 fit in the second grooves 13, and the second grooves 8 fit in the first grooves 12. This will be explained more fully with reference to figs. 2 and 3.

- 5 Fig. 3 thus shows the first thread 7 which fits in a second groove 13. In this case, the second groove 13 is formed as a recess in the second jacket 10 and comprises two substantially vertically extending walls 20, which are connected with each other via a horizontally extending bottom 18. This results in a profile which has a rectangular/conical shape in cross-section.
- 10 The adjacent thread fits in the recess as a loose press fit or a press fit. According to the size of the slip existing therebetween, backflow of the substance may take place. Between the inner face of the second jacket 10 and the outer face of the second stem 6 there is a second gap 21 in which the liquid may be collected in the cases where the jacket is formed with holes.
- 15 Both jackets, i.e. the first jacket 9 and the second jacket 10, may be formed with these holes to provide a sieve plate, or just one of the plates may be formed with these holes. Finally, it should be mentioned that the recess itself, as stated in claim 3, may have a different appearance, as the bottom of the recess may extend right down to the surface of the underlying stem,
- 20 and optionally the bottom may be omitted totally in the cases where it is more expedient to allow the engagement face of the thread to extend directly inwards toward the surface of the stem. The grooves may have a variable depth and width, partly depending on the depth and width of the corresponding threads, partly depending on the form of substance for which the screw press is to be used. The jackets, which are preferably cylindrical or at least rotation-symmetrical, may have the same or different diameters
- 25 and may be disposed close to each other corresponding to a distance of slightly above 0 mm to almost 100 mm.

PATENT CLAIMS

1. A screw press comprising a housing having an inlet for a substance which is pressed in the press, an outlet for discharging the pressed material, as well as at least two oppositely rotating stems around which stems threads are arranged, c h a r a c t e r i z e d in that each stem is surrounded completely or partially by a jacket for providing a first gap between the outer surface of the stem and the inner surface of the jacket, that the jacket comprises grooves/recesses in which grooves/recesses the threads from the adjacent stem engage.
2. A screw press according to claim 1, c h a r a c t e r i z e d in that the stems are conical so that the outer diameter increases toward the outlet.
3. A screw press according to any one of the preceding claims, c h a r a c t e r i z e d in that the depth and/or width of the grooves/recesses is variable.
4. A screw press according to any one of the preceding claims, c h a r a c t e r i z e d in that the threads and the grooves/recesses are thread-shaped/screw-shaped and extend continuously.
5. A screw press according to any one of the preceding claims, c h a r a c t e r i z e d in that the pitch of the threads increases toward the outlet.
6. A screw press according to any one of the preceding claims, c h a r a c t e r i z e d in that the pitch of the grooves/recesses increases toward the outlet.
7. A screw press according to any one of the preceding claims, c h a r a c t e r i z e d in that the threads are mounted on the stem itself.

8. A screw press according to claims 1-6, characterized in that the threads are mounted on the jacket itself.

5 9. A screw press according to any one of the preceding claims, characterized in that the jacket is a rotation-symmetrical member whose central line coincides with the axis of rotation of the stem.

10 10. A screw press according to any one of the preceding claims, characterized in that the jacket comprises a cylindrical pipe whose central line coincides with the axis of rotation of the stem.

15 11. A screw press according to any one of the preceding claims, characterized in that the jacket comprises through openings/holes for providing a sieve plate.

20 12. A screw press according to any one of the preceding claims, characterized in that the jacket comprises several plate elements which, when assembled, provide a surrounding, substantially rotation-symmetrical member around the stem.

25 13. A screw press according to any one of the preceding claims, characterized in that a second space is formed between the outer surfaces of two adjacent jackets, said second space being additionally defined by turns which engage an adjacent groove.

30 14. A screw press according to any one of the preceding claims, characterized in that the position of the stems in the housing may be varied and displaced in an axial direction.

15. A method of pressing a liquid-containing substance in a screw press comprising a housing having an inlet for a substance which is pressed in

the press, an outlet for discharging the pressed material, and at least two oppositely rotating stems around which stems the threads are arranged, characterized in that the screw press comprises a jacket, said jacket being formed with grooves/recesses in which the threads from the adjacent stem engage, said threads in the grooves/recesses performing pressing of the substance by opposite rotation of the two stems, said substance being pressed in areas disposed between two adjacent jackets as well as the defining threads/grooves/recesses.

10 16. Use of a screw press according to claims 1-14 as well as use of the method of claim 15 for the treatment of a liquid-containing substance, e.g. fish offal, sugar beet waste, etc.

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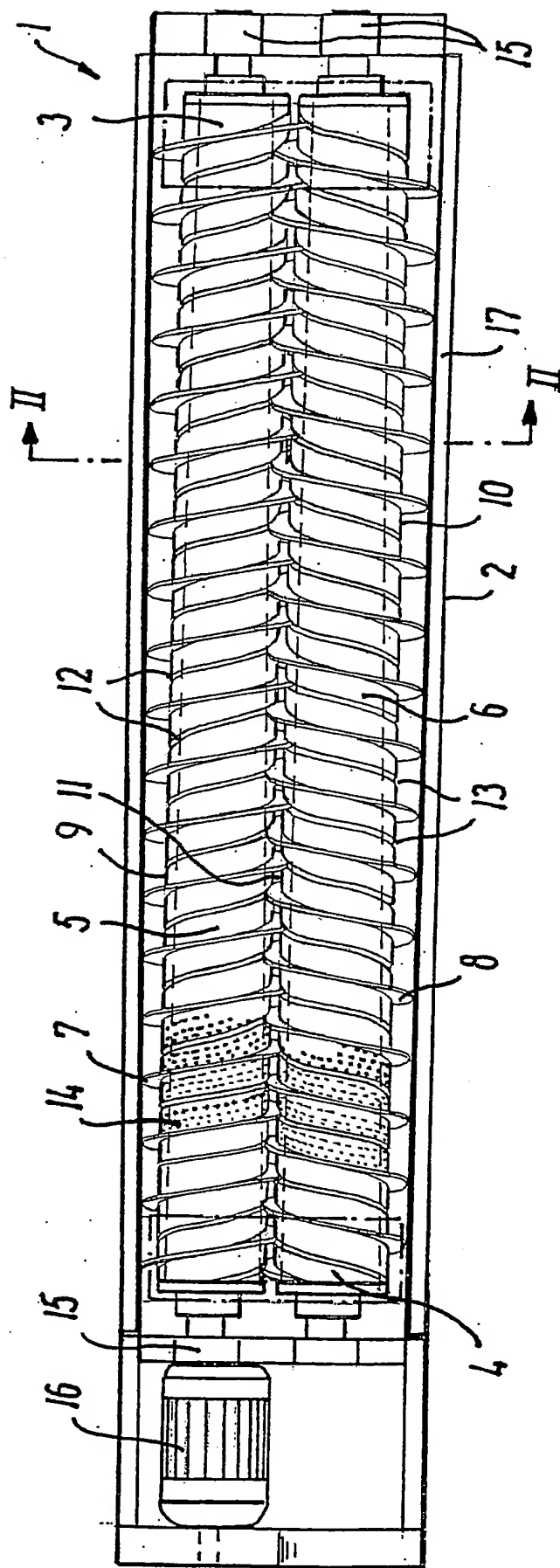
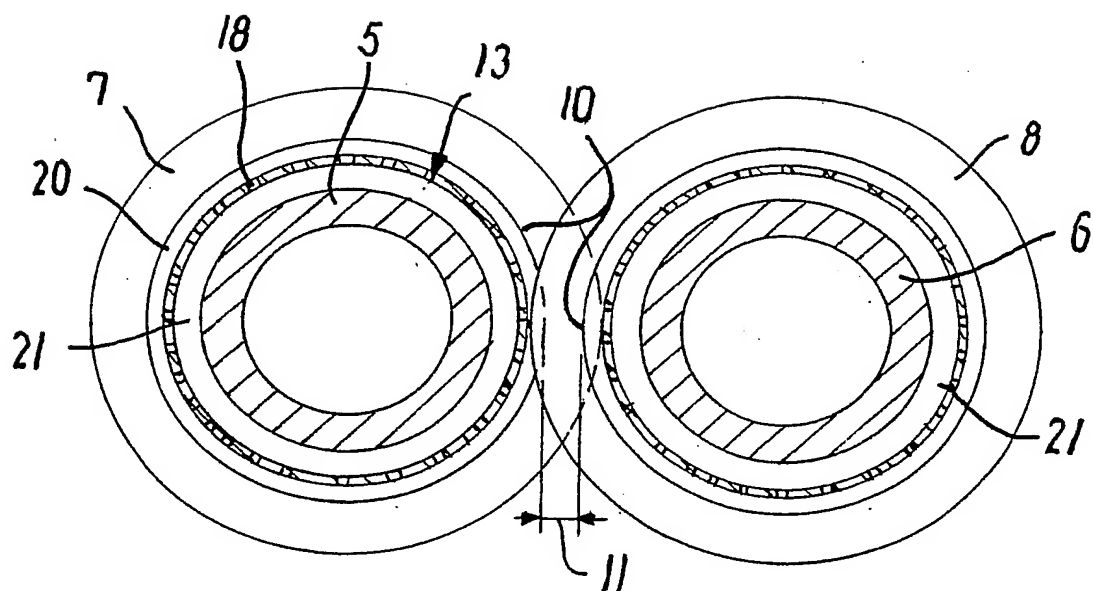
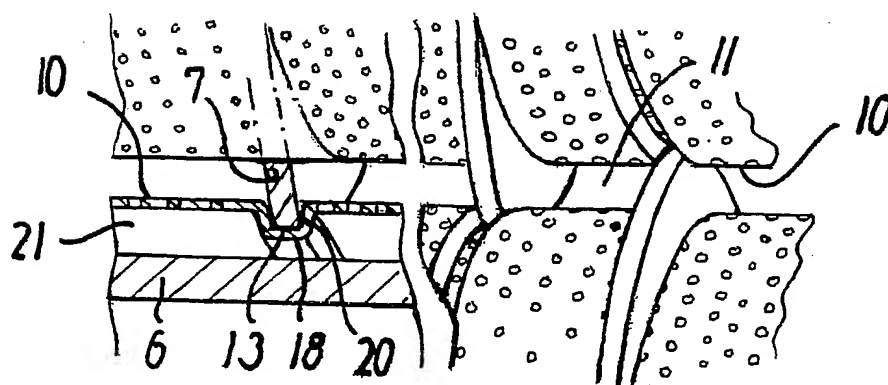


FIG. 1

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**FIG. 2****FIG. 3**

INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B30B9/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B30B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 930 152 A (BABBINI LIONELLO) 21 July 1999 (1999-07-21) figure 12 abstract	1,15,16
A	--- PATENT ABSTRACTS OF JAPAN vol. 009, no. 264 (M-423), 22 October 1985 (1985-10-22) & JP 60 111798 A (MASAKATSU OZAWA), 18 June 1985 (1985-06-18) abstract; figure 1	1,15,16
A	--- US 3 461 793 A (SOLBERG PER) 19 August 1969 (1969-08-19) column 3, line 32 -column 4, line 8; figures 1,2,5 -----	1,15,16

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0930152	A	21-07-1999	IT	MI980066 A1	15-07-1999
			EP	0930152 A1	21-07-1999

JP 60111798	A	18-06-1985	JP	1370350 C	25-03-1987
			JP	61034919 B	09-08-1986

US 3461793	A	19-08-1969	FR	1530904 A	28-06-1968
			GB	1140237 A	15-01-1969

Form PCT/ISA/210 (patent family annex) (July 1992)